



Standard Practice for Field Collection of Soil Samples for Lead Determination by Atomic Spectrometry Techniques¹

This standard is issued under the fixed designation E 1727; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the collection of soil samples using coring and scooping methods. Soil samples are collected in a manner that will permit subsequent digestion and determination of lead using laboratory analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Atomic Absorption Spectrometry (GFAAS).

1.2 This practice is not suitable for collection of soil samples from areas that are paved.

1.3 This practice does not address the sampling design criteria (that is, sampling plan that includes the number and location of samples) that are used for risk assessment and other purposes. To provide for valid conclusions, sufficient numbers of samples must be obtained as directed by a sampling plan.

1.4 This practice contains notes that are explanatory and are not part of the mandatory requirements of this practice.

1.5 The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 Definitions:

2.1.1 *sampling location*—a specific area within a sampling site that is subjected to sample collection. Multiple sampling locations are commonly designated for a single sampling site.

2.1.2 *sampling site*—a local geographical area that contains the sampling locations. A sampling site is generally limited to an area that is easily covered by walking.

2.1.3 *soil collection container*—a container for holding and transporting the soil sample from the field to the laboratory. A sealable rigid walled container or a resealable plastic bag can be used. The internal volume must be sufficient to hold the

entire collected sample.

3. Summary of Practice

3.1 Soil samples are collected using coring or scooping methods.

4. Significance and Use

4.1 This practice is intended for the collection of soil samples in and around buildings and related structures for the subsequent determination of lead concentration, such as described in the HUD Guidelines.² This practice may also be used to collect soil samples from other environments for lead analysis.

4.2 This practice limits soil collection to approximately the top 1.5 cm of soil surface.

5. Apparatus and Materials

5.1 *Soil Coring Tool*, minimum diameter of 2.5 cm, or as agreed upon by the parties requesting and collecting the samples, lead-free, for use in coring. The tool shall be capable of being forced into hard ground without damage to a depth of at least 5 cm (2 in.) and have a mechanism to remove the core from the tool to permit discarding all but the top 1.5 cm (0.6 in.) of the soil core (see Note 1).

NOTE 1—A number of devices can be used or modified for use as soil coring tools. For example: professional stainless steel coring tools equipped with plastic liners, steel pipe, plastic pipe, or small sapling (tree) planters. Removal of the soil core is generally performed using a pair of plungers cut to fit the inside diameter of the coring device. One plunger is equipped with a stop that limits extension of the plunger to within 1.5 cm from the far end of the coring tool. It is used to remove all except the top 1.5 cm of the soil core from the coring tool. The other plunger (without a stop) is used to remove the remaining 1.5 cm of the soil core from the coring tool. The coring procedure in this practice assumes the coring tool has been equipped with these two types of plungers.

5.2 *Plastic Centrifuge Tubes*, for use in scooping; 50 mL with tight fitting cap. These tubes are not prohibited from serving as soil collection containers.

5.3 *Spoon*, lead-free, for use in scooping.

5.4 *Plastic Bags*, for use as soil collection containers; approximately 1 L or 4 L (1 qt or 1 gal) resealable plastic bags.

5.5 *Steel or Plastic Measuring Tape*.

¹ This practice is under the jurisdiction of ASTM Committee E-6 on Performance of Buildings and is the direct responsibility of Subcommittee E06.23 on Lead Paint Abatement.

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² *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, U.S. Department of HUD, Washington, DC, June 1995.

5.6 *Plastic Gloves*, powderless.

5.7 *Permanent Ink Marker*.

5.8 *Wipe*—Disposable towlettes moistened with a wetting agent. This towel is used to clean sampling equipment. Wipe brands or sources selected for use shall contain insignificant background lead levels. Rinsing with drinking water will also assist in cleaning sampling equipment.

6. Procedure for Core Sampling

6.1 The following procedure is for collection of soils using a coring method at a given sample location within a sampling site. Coring methods are effective for collection from dense, hard, or sticky soils. Coring methods are not intended for collection of loose, sandy soils (see Note 2).

NOTE 2—Coring methods are more effective than scooping methods for the collection of reproducible replicate samples. Coring methods have the advantage of sampling a reproducible cross-sectional area and depth.

6.1.1 Don a pair of clean, powderless, plastic gloves (see Note 3).

NOTE 3—Lead contamination problems during field sampling can be severe and can affect soil analysis results. Contamination can be minimized through adherence to the following recommendations: change gloves frequently. Collection of each new sample should be conducted with a new pair of gloves. Powderless gloves are recommended to minimize contamination of the collected soil from powders used in "powdered" gloves. Clean sampling equipment and measuring tapes frequently with wipes or water. Do not handle soil collection containers until just prior to use.

6.1.2 If needed, clean the coring tool using wipes or drinking water. Check the stop on the core plunger (the one with a stop) to ensure that the plunger tip stops at a distance of 1.5 cm from the end of the coring tool or the portion of the tool that collects the soil core. Adjust the stop if needed.

6.1.3 Place a directional arrow on the outside of the tool with the head pointed toward the ground (see Notes 4–6). Grip the coring tool firmly between two hands and drive the tool into the soil surface at the designated sampling location with the directional arrow point facing down using a slight twisting motion to a depth of approximately 5 cm (2 in.).

NOTE 4—The directional arrow is used to identify which end of soil core is the top (that is, the surface of the ground). Its use will avoid inadvertent loss of the top of the soil core when the plungers are used to remove and collect the soil sample.

NOTE 5—Use of a professional stainless steel coring tool equipped with plastic liners may require insertion of a plastic liner and assembly. Follow the manufacturers instruction for proper setup using these types of coring tools, prior to driving the tool into the ground. For coring tools that use liners, the directional arrow must be marked on the liner, not the tool.

NOTE 6—For extremely hard soils (that is, hard packed or frozen), a hammer or other similar device may be needed to drive the tool into the ground. If conditions do not allow for full penetration to 5 cm, make every effort to penetrate to a depth of at least 1.5 cm. If the penetration is less than 1.5 cm, documentation generated for the sample should indicate the approximate depth achieved.

6.1.4 Twist and snap the coring tool to one side and carefully remove the tool from the ground while retaining the soil core in the tool.

6.1.5 Insert a clean plunger (with stop) into the top end of the liner. (The bottom end is indicated by the arrow head drawn on the tool. The top end is the opposite opening.) Push out all

but 1.5 cm of the soil core from the tool with the plunger. Using a gloved finger, wipe off the excess soil protruding from the tool. Discard the soil pushed out of the tool.

6.1.6 Using a clean plunger (without stop), push the remaining 1.5 cm section of the core sample into a soil collection container.

6.1.7 Collect two more soil cores within a 0.3 m (1 ft) diameter circle around the first core using the same procedure described in 6.1.2–6.1.6. Composite these cores into the same soil collection container. Label the soil collection container with sufficient information to uniquely identify the sample. Discard the gloves in the trash bag after all three cores have been collected and composited.

6.1.8 Don a pair of clean, powderless, plastic gloves. Clean the coring tool and plungers using wipes or drinking water until visibly clean after each use. Discard the wipes and gloves in a trash bag.

7. Procedure for Scoop Sampling

7.1 The following procedures are for collection of soils using scoop sampling methods. For scoop sampling, collect soils at a given sample location within a sampling site using one of the methods. Scooping methods are effective for collection from semisoft, sticky, and loose, sandy soils (see Note 2). Scooping methods are not intended for the collection of soils from very hard or frozen soils.

NOTE 7—The scooping methods described here may result in collection bias toward increased amounts of surface soil as opposed to subsurface soil because of the curvature of the collection tools.

7.1.1 *Scoop Sampling Using a Plastic Centrifuge Tube:*

7.1.1.1 Don a pair of clean, powderless, plastic gloves (see Note 3).

7.1.1.2 Determine the proper burying depth of the tube needed to collect approximately the top 1.5 cm of soil using a measuring tape and a plastic 50-mL centrifuge tube (see Note 8).

NOTE 8—For example; if the plastic centrifuge tube is about 3 cm in diameter, then the proper burying depth during scooping is to insert the tube into the soil until the soil surface is about even with the center of the tube.

7.1.1.3 Remove the cap of the plastic centrifuge tube and insert the open end of the tube into the soil at the sampling location to the desired depth as determined in 7.1.1.2. Collect the soil into the tube by pushing or pulling the tube through the soil surface while maintaining the burying depth of the tube in the soil. Move the tube a distance of 10 to 20 cm (4 to 8 in.) across the soil surface to complete collection of the soil into the tube.

7.1.1.4 Remove the tube from the ground and wipe off any excess soil clinging to the outside of the tube and cap threads with a gloved finger. Replace the cap. Label the plastic centrifuge tube with sufficient information to uniquely identify the sample. Discard the gloves in the trash bag.

7.2 *Scoop Sampling Using a Spoon:*

7.2.1 Don a pair of clean, powderless, plastic gloves (see Note 3).

7.2.2 Using a measuring tape and a clean spoon, dig a small test hole adjacent to the sampling location to the depth of 1.5

cm. Use this hole as a visual aid during soil collection to help limit collection to a depth of 1.5 cm. Clean the spoon using a wipe.

7.2.3 Collect soil into a soil collection container by scooping soil with the spoon down to the depth indicated by the test hole (see 7.2.2). Continue to collect soil until a circular hole of approximately 5 cm diameter (1.5 cm deep) has been created.

7.2.4 Collect soil from two more locations within a 0.3 m (1 ft) diameter circle around the first sample location using the same procedure described in 7.2.1-7.2.3. Composite these scoop samples into the same soil collection container. Label the soil collection container with sufficient information to uniquely identify the sample. Discard the gloves in a trash bag after all three scoop samples have been collected and composited.

7.2.5 Don a pair of clean, powderless, plastic gloves. Wipe off the spoon after each use. Discard the wipes and gloves in the trash bag.

8. Report

8.1 Field data related to sample collection shall be documented in a sample log form or field notebook (see Note 9). If field notebooks are used, then field notebooks shall be bound with prenumbered pages. All entries on sample data forms and field notebooks shall be made using ink with signature and date

of entry. Any entry errors shall be corrected by using only a single line through the incorrect entry (no scratch outs) accompanied by the initials of the person making the correction and the date of correction (see Note 10).

NOTE 9—Field notebooks are useful for recording field data even when preprinted sample data forms are used.

NOTE 10—These procedures are important to properly document and trace field data.

8.2 At a minimum, document the following information:

8.2.1 Project or client name, address, and city/state location,

8.2.2 General sampling site description,

8.2.3 Information as to what specific collection protocol was used,

8.2.4 For each sample collected: an individual and unique sample identifier and date of collection. This shall be recorded on the sample container in addition to the field documentation, and

8.2.5 For each sample collected: name of person collecting the sample and specific sampling location data from which the sample was removed.

9. Keywords

9.1 coring; lead; sample collection; scooping; soil

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Standard Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques¹

This standard is issued under the fixed designation E 1728; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the collection of settled dusts on hard surfaces using a wipe sampling method. These samples are collected in a manner that will permit subsequent digestion and determination of lead using laboratory analysis techniques such as Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), and Graphite Furnace Atomic Absorption Spectrometry (GFAAS).

1.2 This practice is used to collect samples for subsequent determination of lead on a loading basis (micrograms of lead per area sampled). This practice cannot be used to collect samples for subsequent determination of lead on a concentration basis (micrograms of lead per gram of settled dust collected).

1.3 This practice is not intended for collection of settled dust samples from rough or porous surfaces such as upholstery and carpeting.

1.4 This practice does not address the sampling design criteria (that is, sampling plan that includes the number and location of samples) that are used for risk assessment and other purposes. To provide for valid conclusions, sufficient numbers of samples must be obtained as directed by a sampling plan.

1.5 This practice contains notes that are explanatory and are not part of the mandatory requirements of this practice.

1.6 The values stated in SI units are to be regarded as the standard.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 Definitions:

2.1.1 *batch*—a group of field or quality control (QC) samples that are collected or processed together at the same site

using the same reagents and equipment.

2.1.2 *field blank*—a wipe that is exposed to the same handling as field samples except that no sample is collected (no surface is actually wiped). Analysis results from field blanks provide information on the analyte background level in the wipe combined with the potential contamination experienced by samples collected within the batch resulting from handling.

2.1.3 *sampling location*—a specific area within a sampling site that is subjected to sample collection. Multiple sampling locations are commonly designated for a single sampling site.

2.1.4 *sampling site*—a local geographical area that contains the sampling locations. A sampling site is generally limited to an area that is easily covered by walking.

2.1.5 *wipe*—disposable towlettes moistened with a wetting agent (see 2.1.5.1 and 2.1.5.2). These towlettes are used to collect the sample and to clean sampling equipment. Wipe brands or sources selected for use shall not contain significant background lead levels (see 2.1.5.1). Wipe brands or sources selected for use shall be of adequate width and thickness to perform the collection procedure (see 2.1.5.2).

2.1.5.1 *Discussion 1*—Laboratory analysis on replicate blank wipes should be used to determine background lead levels prior to use in the field. Brands of wipes that contain aloe should be avoided due to increased potential of significant background lead in these wipes. Background lead levels less than 5 µg per wipe are considered insignificant for most investigative purposes.

2.1.5.2 *Discussion 2*—A thin wipe having dimensions of approximately 15 by 15 cm is recommended. Use of multiple or extra-thick wipes can cause problems with laboratory analysis activities. Use of wipes with smaller dimensions may not be capable of holding settled dust contained within the sampling area.

2.1.6 *wipe sampling kit*—a sealable rigid walled container with 50 mL minimum volume (see discussion below) and a separate container of clean uncontaminated wipes for use in collecting samples. One container of bulk packed wipes is typically used for collection of multiple samples.

2.1.6.1 *Discussion*—Use of a resealable plastic bag for holding and transporting the settled dust wipe sample is not recommended due to the potential losses of settled dust within

¹ This practice is under the jurisdiction of ASTM Committee E-6 on Performance of Buildings and is the direct responsibility of Subcommittee E06.23 on Lead Paint Abatement.

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the plastic bag during laboratory handling. Quantitative removal and processing of the settled dust wipe sample by the laboratory is significantly improved through the use of sealable rigid walled containers.

3. Summary of Practice

3.1 Wipe samples of settled dust are collected on hard surfaces from areas of known dimensions with moistened disposable towelettes using a specified pattern of wiping.

4. Significance and Use

4.1 This practice is intended for the collection of settled dust samples in and around buildings and related structures for the subsequent determination of lead loading (micrograms of lead per area sampled) such as described in the HUD Guidelines.² This practice may also be used to collect settled dust samples from other environments for lead analysis.

4.2 Use of different pressures applied to the sampled surface along with use of different wiping patterns contribute to collection variability. Thus, the sampling results can vary between operators performing collection from identical surfaces as a result of collection variables. Collection for any group of sampling locations at a given sampling site is best when limited to a single operator.

4.3 This practice is limited to collection of settled dust samples from hard, relatively smooth nonporous surfaces. This practice is not intended for collecting settled dust samples from surfaces with substantial texture such as rough concrete, brickwork, textured ceilings, and soft fibrous surfaces such as upholstery and carpeting, to name a few.

5. Apparatus and Materials

5.1 *Sampling Templates*—A 30 by 30 cm (approximately 1 ft²) reusable aluminum or plastic, or disposable cardboard or plastic template, (full-square, rectangular, square "U-shaped," rectangular "U-shaped," and "L-shaped") or alternative area that have accurately known dimensions (see Notes 1 and 2).

NOTE 1—It is recommended to collect settled dust from a minimum of a 10 by 10 cm area³ to provide sufficient material for laboratory analysis. Use of templates or collection areas larger than 30 by 30 cm may be appropriate for surfaces that have little or no visible settled dust. A smaller sampling area (for example, 10 by 10 cm) is desired for surfaces with high levels of visible settled dust.

NOTE 2—Templates should be thin (less than 3 mm), and be capable of lying flat on a flat surface.

5.2 *Wipes*—See 2.1.5 for definition.

5.3 *Resealable Rigid Walled Containers*, 50-mL minimum volume. Screw-top plastic centrifuge tubes are an example of a suitable rigid walled container.

5.4 *Steel or Plastic Measuring Tape*.

5.5 *Plastic Gloves*, powderless.

5.6 *Disposable Shoe Covers*, optional.

6. Procedure

6.1 Don a pair of clean, powderless, plastic gloves (see Note 3).

NOTE 3—Lead contamination problems during field sampling can be severe and affect settled dust analysis results. Contamination can be minimized through adherence to the following recommendations:

(1) Change gloves frequently. Collection of each new sample must be conducted with a new pair of gloves. Powderless gloves are recommended to minimize contamination of the collected settled dust from powders used in "powdered" gloves.

(2) Clean sampling equipment and measuring tapes frequently with wipes or water.

(3) Do not open sampling kits (rigid walled containers and bulk packed wipes) until just prior to use.

(4) Use of disposable shoe covers between different buildings and removal of them prior to entering vehicles can be helpful to minimize inadvertent transfer of settled dust from one location to another.

6.2 At the beginning of a sampling period (or if a new bulk-packed container of wipes is opened), remove a minimum of the top three wipes from the container (wipe off gloved fingers with each wipe as they are removed). Use succeeding wipes from the container for sample collection (see Note 4).

NOTE 4—This procedure will minimize the risk of inadvertent contamination from dust settling into the wipe container and eliminate the potential inadvertent use of partially dried out wipes.

6.3 Use one of the following two procedures for collecting settled dust samples from each sampling location. For wide flat locations, use the template-assisted sampling procedure. For small locations (for example, a window sill or door jamb), use the confined-area sampling procedure.

6.4 Collect field blanks at a frequency of 5 % (or 1 for every 20 field samples collected). The minimum number of field blanks to collect for each batch of wipes used (each new sampling kit opened) is three. Designate the first wipe (after removal of a minimum of three wipes, see 6.2) and the last wipe as a field blank. In addition, designate a field blank during the course of collection at a given site (that is, from the middle of the wipes used to collect settled dust samples). Identify these field blanks in a manner that correlates them with the samples collected using the same batch of wipes at the same site. Utilization of a previously used batch of wipes at a new sampling site shall be conducted in the same manner as a new batch of wipes (that is, sample collection at each sampling site must include a minimum of three field blanks).

6.4.1 *Template-Assisted Sampling Procedure:*

6.4.1.1 Carefully place a clean template on the surface in a manner that minimizes disturbance of settled dust at the location. Either tape or place a heavy object on the outside edge of the template to prevent the template from moving during sample collection.

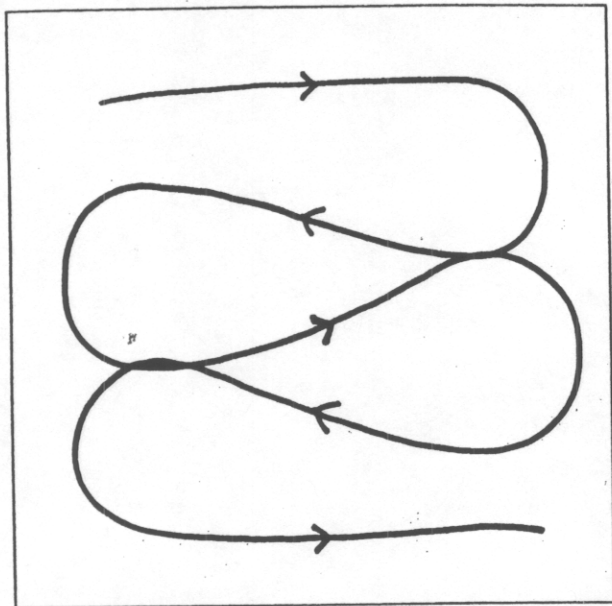
6.4.1.2 Using an open flat hand with the fingers together, wipe the selected surface area, side to side, in a overlapping "S" pattern while applying pressure to the finger tips (see Fig. 1). Wipe so that the entire selected surface area is covered (see Notes 3-5).

NOTE 5—Perform the wiping procedure using the fingers, not the palm of the hand.

6.4.1.3 Fold the wipe in half with the sample side folded in

² Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, U.S. Department of HUD, Washington, DC, June 1995.

³ Eller, P. M. and Cassinelli, M.E., eds., *NIOSH Manual of Analytical Methods*, 4th ed., Method No. 9100, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Cincinnati, OH, 1994.



NOTE 1—Only the center of wipe path is shown, not the entire wiping width. The up-and-down overlapping “S” pattern wiping path is the same path turned 90°.

FIG. 1 Example of a Side-to-Side Overlapping “S” Pattern Wiping Path

and repeat the preceding wiping procedure within the selected surface area using an up and down overlapping “S” pattern (see Fig. 1 and Note 6).

NOTE 6—Wipes are folded to envelop the settled dust within the wipe and avoid settled dust losses and to expose a clean wipe surface for further settled dust collection. For areas containing large amounts of settled dust, care must be taken during wiping to capture the settled dust within the wipe.

6.4.1.4 Fold the wipe in half again with the sample side folded in and repeat the wiping procedure one more time, concentrating on collecting settled dust from the corners within the selected surface area (see Note 6).

6.4.1.5 Fold the wipe again with the sample side folded in and insert the folded wipe into a rigid walled container.

6.4.1.6 Label the rigid walled container with sufficient information to uniquely identify the sample and record the dimensions (in centimetres) of the selected sampling area (the internal template dimensions). Discard the gloves in a trash bag. Cap the container

6.4.2 Confined Area Sampling Procedure:

6.4.2.1 Holding the fingers together and flat against the selected surface area, wipe the measured surface in one direction (see Notes 3-5). Apply pressure to the fingers while wiping the surface.

6.4.2.2 Fold the wipe in half with the sample side folded in and repeat the preceding wiping procedure using a reverse direction within the selected surface area on one side of the folded wipe (see Note 6).

6.4.2.3 Fold the wipe in half with the sample side folded in and repeat the preceding wiping procedure one more time, concentrating on collecting settled dust from the corners within the selected surface area (see Note 6).

6.4.2.4 Fold the wipe again with the sample side folded in and insert the folded wipe into a rigid walled container.

6.4.2.5 Label the rigid walled container with sufficient information to uniquely identify the sample. Measure and record the dimensions (in centimetres) of the selected sampling area (the area actually wiped during sample collection). Discard the gloves in a trash bag. Cap the container

7. Report

7.1 Field data related to sample collection must be documented in a sample log form or field notebook (see Note 7). If field notebooks are used, then field notebooks shall be bound with prenumbered pages. All entries on sample data forms and field notebooks shall be made using ink with signature and date of entry. Any entry errors shall be corrected by using only a single line through the incorrect entry (no scratch outs) accompanied by the initials of the person making the correction and the date of correction (see Note 8).

NOTE 7—Field notebooks are useful for recording field data even when preprinted sample data forms are used.

NOTE 8—These procedures are important to properly document and trace field data.

7.2 At a minimum, the following information shall be documented:

7.2.1 Project or client name, address, and city/state location,

7.2.2 General sampling site description,

7.2.3 Information as to what specific collection protocol was used,

7.2.4 Information as to what specific type or brand of wipes was used,

7.2.5 Information on quality control (QC) samples: which samples are associated with what group of field blanks,

7.2.6 For each sample collected: an individual and unique sample identifier, dimensions of the area sampled (in centimetres), the calculated area sampled (in square centimetres), and date of collection. This shall be recorded on the sample container in addition to the field documentation, and

7.2.7 For each sample collected: name of person collecting the sample and specific sampling location information from which the sample was removed.

8. Keywords

8.1 lead; sample collection; settled dust; wipe

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Standard Specification for Wipe Sampling Materials for Lead in Surface Dust¹

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1. Scope

1.1 This specification covers requirements for wipe materials that are used to collect settled dusts on hard surfaces for the subsequent determination of lead.

1.2 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:

E 105 Practice for Probability Sampling of Materials²

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method^{2,3}

E 1613 Test Method for Analysis of Digested Samples for Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption (FAAS), or Graphite Furnace Atomic Absorption (GFAAS) Techniques⁴

E 1644 Practice for Hot Plate Digestion of Dust Wipe Samples for Determination of Lead by Atomic Spectrometry⁴

E 1728 Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques⁴

3. Terminology

3.1 Definitions:

3.1.1 *wipe, n*—a disposable, porous paper (cellulosic) towellette that is moistened with a wetting agent.

3.1.1.1 *Discussion*—The towellette is used to collect a sample of settled dust on a smooth, hard surface for subsequent lead analysis.

4. Manufacture

4.1 The wipes shall be made from materials using methods

that ensure compliance with the requirements of Sections 5 and 7, and shall be clean and free of imperfections that would affect their performance.

5. General Requirements

5.1 Test data must be provided to assure compliance with the following requirements. Unless otherwise specified, test data are to be provided by the wipe producer. Users of wipes may also conduct prescribed tests.

5.1.1 Each wipe shall contain less than 5.0 μg of background lead, as determined by Practice E 1644 and Test Method E 1613, or NIOSH Method 7105 (1),⁵ or an equivalent analytical procedure (2).

5.1.2 Wipes shall be sufficiently rugged to be used on a 1000 cm^2 surface area of a smooth surface, such as tile, plastic, metal, wood, or glass, without tearing. A smooth surface for purposes here is defined as having a roughness factor of ≤ 10 (3), where a roughness factor of unity represents an ideally flat surface.

5.1.3 Wipes shall have a moisture content such that the coefficient of variation for a random sampling of the lot of wipes be no greater than 25 %. A minimum of 15 samples of the lot shall be tested.

5.1.4 Wipe dimensions shall be between 10 by 10 cm and 20 by 20 cm.

5.1.5 The dry wipe thickness shall be measured for at least 15 randomly selected samples of a lot. Wipes so measured shall have an average thickness of at least 0.005 cm but no greater than 0.10 cm.

5.1.6 The coefficient of variation in mass of dry wipes in a lot shall not exceed 5 %. A minimum of 15 samples of the lot shall be tested.

5.1.7 Lead recoveries from wipes spiked with National Institute of Standards and Technology (NIST) Standard Reference Materials (SRM) shall be 100 ± 10 %, 95 % confidence level, of the lead recovery from the SRM alone, that is, *sans* wipe material, as determined by Practice E 1644 and Test Method E 1613, or NIOSH Method 7105, or equivalent procedure.

NOTE 1—It is not imperative that the wipe be completely dissolved when digested in accordance with Practice E 1644 or an equivalent procedure to meet the recovery criterion. However, the solution that is to

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² Annual Book of ASTM Standards, Vol 14.02.

³ ASTM Standards on Precision and Bias for Various Applications, 3rd Ed., ASTM, Philadelphia, PA, 1988.

⁴ Annual Book of ASTM Standards, Vol 04.11.

⁵ The boldface numbers in parentheses refer to the list of references at the end of this standard.

be analyzed (after digestion) should be free of suspended particulates and gelatinous material. Reference (2) describes a specific procedure and criteria for the evaluation of the digestibility of wipe materials.

5.1.8 Collection efficiency of an individual wipe, using an initial wipe on a given smooth nonporous test surface, shall be determined using aerosolized lead oxide as per Ref (4), or lead-containing NIST SRM as per Ref (5). The maximum mass of lead-containing material (particulate or dust) loaded per surface area unit to be sampled shall be 0.5 g. The minimum collection efficiency of an individual wipe shall be 75 %, as measured against the known mass of lead loaded on the test surface prior to wiping. Relative collection efficiency of lead from wipes shall be at least 75 %, as measured against the amount of lead determined from a second wiping of the same location (100 cm² minimum surface area). That is, the lead content determined from a wipe used for the initial wiping shall be at least three times the lead content determined from the second wiping of the same location.

6. Significance and Use

6.1 This specification is intended for use by manufacturers to evaluate the performance of wipe sampling materials for lead in surface dust.

6.2 This specification may also be employed by users of wipe materials in order to compare the performances of candidate wipes for the sampling of lead in surface dust.

7. Procedure

7.1 Unless otherwise specified, the manufacturer is responsible for ensuring that all test procedures described in this section are conducted. Users of wipes may also conduct prescribed tests. Described tests are to be conducted on wipes selected in accordance with the random sampling procedure described in Practice E 105, using wipes sampled after packaging, and representative of the batch.

7.2 Recoverability of lead from spiked wipes shall be measured in accordance with Practice E 1644 and Test Method E 1613, or NIOSH Method 7105, or an equivalent procedure. Background lead in unspiked wipes shall be measured in accordance with the same procedure. A minimum of 60 wipes (30 spiked, 30 unspiked) shall be tested in this manner. See Ref (2) for additional guidelines on the spiking, digestion, and analysis procedure.

7.3 Collection efficiency of lead shall be measured in the following manner (4, 5):

7.3.1 First, a delineated area of a hard smooth surface (minimum area 100 cm²) is loaded with a known mass (≤ 1 g) of particulate or dust and then wiped in accordance with Practice E 1728, NIOSH Method 9100 (6), or an equivalent procedure. Use the procedures described in Ref (4) or (5) to determine the collection efficiency of the first (individual) wipe (see 5.1.8).

7.3.1.1 The same surface location is then wiped in the identical manner with a second wipe, and the lead content determined using the procedure described in Ref (2).

7.3.1.2 An equivalent procedure to that described in Ref (4) may consist of manually distributing a known amount (mass)

of NIST SRM uniformly onto a hard smooth surface, of 100 to 1000 cm² area, and then wiping the surface with two successive (separate) wipes (5). The collection efficiency of a first wiping is determined by comparing the amount of lead collected in the first wipe (determined using dust sampling and analytical procedures described in Refs (2), (4), and (5) against the total amount of lead loaded onto the area of interest on the test surface.

7.3.1.3 The relative collection efficiency is then determined by comparison of the amount of lead collected in the first wipe to the amount of lead collected in the second wiping (see 5.1.8).

7.3.2 The procedure described in 7.3.1 is to be repeated for at least five different locations of the surface or surfaces to be tested. Hence, a total of 60 wipes are to be tested: 30 first wiping and 30 second wiping.

7.3.3 The wipes are to be digested and the lead content determined in accordance with Practice E 1644 and Test Method E 1613, or NIOSH Method 7105, or an equivalent procedure as described in Ref (2).

7.4 Calculation—Average the results from lead determinations for each of the four sets of 30 wipes tested in 5.1.1 and 5.1.2, and compute the coefficient of variation for each set. See Practice E 691 for details regarding statistical computations. Wetness of wipes is determined by weighing the wipe before and after quantitative drying, and calculating the difference.

8. Packaging and Package Marking

8.1 Wipes shall be wrapped individually or in multiples per package. Wipes shall be wrapped and packaged according to trade custom.

8.2 Each unit or package shall be marked with the manufacturer's name, size of wipe, date of manufacture, and lot number.

8.3 Each package shall be marked with principal ingredients of the wipe material.

8.4 If the ASTM designation is used in marking and packaging, it shall be stated that the material meets the specifications delineated in this specification, and that supporting performance data are available upon request.

9. Quality Assurance

9.1 Responsibility for Inspection and Tests—Unless otherwise specified, the manufacturer is responsible for ensuring that all inspection and test requirements specified herein are conducted.

10. Recordkeeping

10.1 All supporting data from tests conducted for each lot shall be kept by the manufacturer for a minimum of ten years. All of this information shall be recorded in bound notebooks (with numbered pages) or on data sampling forms, or both. All test information shall be available for release to users of wipe materials upon request.

11. Keywords

11.1 lead; surface dust; wipe

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- (6) NIOSH Method 9100, "Lead in Surface Wipe Samples," *NIOSH Manual of Analytical Methods*, 4th Ed., P. M. Eller and M. E. Cassinelli, eds., National Institute for Occupational Safety and Health, Cincinnati, OH, 1994.

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